Stream Water Chemistry in a Mountain Forest near the Tokyo Metropolitan Area and the Impact of Atmospheric Deposition (3)

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In the Tanzawa mountains, which is located in the western part of Kanagawa prefecture, it has been reported that fir trees decayed and surface soils were acidified. We have revealed that high concentrations of nitrate run off through stream water on Mt. Oyama (1252 m a.s.l.), which is located in the southeastern part of the Tanzawa mountains and easily affected by air pollutants transported from the Tokyo metropolitan area.
We here report stream water chemistry during the 9 years from 2007 to 2015 in the eastern Tanzawa mountains and evaluate the impacts of atmospheric deposition using stable isotopes of hydrogen and oxygen in water. Total dissolved nitrogen (TDN) concentration (the sum of nitrate nitrogen; NN, ammoniumnitrogen; AN, and dissolved organic nitrogen; DON) in stream water in the eastern Tanzawa mountains during 9 years was 1.12 mgN/L in the southeastern area on average, 0.99 mgN/L in the southwestern area, and 0.67 mgN/L in the northern area. The ratio of the TDN concentration in 2007 to that in 2015 was 0.60 in the northern area, 0.62 in the southeastern area, 0.69 in the southwestern area, respectively. TDN decreased in three areas of the eastern Tanzawa mountains, especially in the northern area. The contribution of NN decreased while the contribution of DON increased in all three areas, especially in the northern area. ANdidn't have a clear trend in all areas. Decrease of TDN was due tothe decrease of NN in stream water, which could be the decrease of atmospheric inorganic nitrogen deposition and/or the suppression of nitrification in surface soils.

The stable isotope ratios of hydrogen and oxygen in stream water on the eastern Tanzawa mountains declined with the increase of altitude. Such a tendency is also reported in surface water in Japan, and is generally due to the evaporation effect, namely light water easily evaporates as surface water runs from the upper reaches to the lower. The stable isotope ratios in throughfall of cedar at the top of Mt. Oyama were higher than those in rainfall and stable isotope ratios in stream water distributed between them. The amount of throughfall in the lowland forest is generally about 70% of rainfall amount due to canopy interception, which makes isotope fractionation occur due to the evaporation in the canopy.Then the stable isotope ratios of hydrogen and oxygen inthroughfall become heavy, but the amount of Cedar throughfallwas 1.8 times more than rainfall amount at the top of Mt. Oyama. The difference in stable isotope ratios between in throughfall and in rainfall could be due to fog water deposition because fog occurs frequently on Mt. Oyama.

Keywords: Stable Isotope, Nitrogen Saturation, Nitrate Nitrogen, Ammonium Nitrogen, Dissolved Organic Nitrogen, Nitrification

